

# Association between Vision-related Quality of Life and Mental Health Status among Glaucoma Patients in a Tertiary Care Hospital, Uttar Pradesh, India: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Glaucoma is a chronic, progressive optic neuropathy that can lead to blindness. It is a multifactorial disorder, with elevated Intraocular Pressure (IOP) being one of the modifiable risk factors. Glaucoma affects the emotional and psychological wellbeing of patients, even in the early stages of the disease, impacting their Quality of Life (QoL).

**Aim:** To assess the association between vision-related QoL and mental health status among glaucoma patients.

**Materials and Methods:** A cross-sectional survey was conducted on 110 glaucoma patients aged 18 to 70 years who were residents of Barabanki district, Uttar Pradesh, India from September 2023 to December 2023. Glaucoma severity was graded based on mean deviation measured by visual field testing. Anxiety and depression levels were graded using the Hamilton Anxiety Rating Scale (HAM-A) and Hamilton Depression Rating Scale (HAM-D). QoL was assessed using the Glaucoma QoL-15 questionnaire. Data analysis was performed using Statistical Package for Social

Sciences (SPSS) software version 27.0, and the association between different variables was examined using Chi-square, Fisher's exact test, and Analysis of Variance (ANOVA) test. A p-value of <0.05 was considered significant.

**Results:** Among the 110 participants, 47 (42.7%) were females and 63 (57.3%) were males, with an average age of 52.6±12.2 years. 56 (50.9%) had moderate anxiety, and 59 (53.6%) had moderate levels of depression. QoL factors assessed included peripheral vision, dark adaptation and glare, central and near vision, and outdoor mobility. Statistically significant differences were observed between different severity levels of glaucoma (p-value <0.05) in relation to these factors. A comparison of glaucoma severity, anxiety level, and depression level with QoL revealed a significant difference (p-value <0.001).

**Conclusion:** Glaucoma impacts the mental health status of patients by causing anxiety and depression, as well as affecting their QoL. As the severity of glaucoma increases, anxiety and depression levels rise, while QoL decreases.

**Keywords:** Glaucoma and anxiety, Glaucoma and depression, Quality of life factors

## INTRODUCTION

A diverse range of disorders collectively called glaucoma include cupping, optic nerve atrophy, and the typical loss of vision field frequently linked to elevated IOP [1]. Depending on the condition of the iridocorneal angle, two types of primary glaucoma are identified: Primary Angle-Closure Glaucoma (PACG) and Primary Open-Angle Glaucoma (POAG) [2]. High-Tension Glaucoma (HTG) and Normal-Tension Glaucoma (NTG) are the two subtypes of POAG. PACG is characterised by high IOP related to mechanical restriction of aqueous outflow by apposition of the iris to the trabecular meshwork [3]. PACG presents with a crowded anterior segment and limited anterior chamber angle. In patients with PACG, pressure-dependent damage is thought to be the primary cause of glaucomatous optic neuropathy [3]. The mechanism of optic nerve damage in HTG is believed to be both pressure-dependent and pressure-independent [4].

Apart from intracranial pressure, there are other potential contributing factors to the onset and exacerbation of hypertension, including choroidal blood flow, vascular dysregulation, and low cerebrospinal fluid pressure [5-7]. The number of people with glaucoma worldwide increased from 60.5 million in 2010 to 79.6 million in 2020 [8]. It is predicted to increase to 111.8 million by 2040 [9]. Studies conducted on a population in South India have revealed that the prevalence of POAG ranges from 1.62-3.51%, whereas that of PACG is between 0.5-4.3% [10-15]. In India, there are an estimated 6.48 million POAG and 2.54 million PACG sufferers. Worldwide, glaucoma is thought to be the cause of moderate to severe vision impairment in 4.5 million

people and blindness in 3.2 million [16]. One of the main causes of blindness (5.81%) is glaucoma, which affects 1.5 million people worldwide [17].

Glaucoma is a chronic condition that causes irreversible damage to the ganglion cells, often without the patient being aware of the significant damage until it has already occurred [18]. Research has shown that significant sight loss is associated with a lower QoL [19]. Therefore, QoL research conducted on glaucoma patients may also serve as a predictor of the effectiveness of their therapy [20]. An estimated 10.9-24.7% of glaucoma patients may have depression, while 13-30% may experience anxiety [21-23]. It has been shown that anxiety is more common in younger people. Nonetheless, patients with glaucoma were found to be more likely to experience depression at an older age and in cases of more severe glaucoma [24]. As QoL scores deteriorate with increasing disease severity, QoL is becoming a more crucial metric in treating glaucoma [25]. Several Indian studies have reported on the impact of glaucoma on QoL [26,27]; however, these studies have not specifically examined any potential correlations with anxiety and depression. Therefore, the present cross-sectional study was designed to evaluate the association between the severity of glaucoma, anxiety, depression, and vision-related QoL in glaucoma patients.

## MATERIALS AND METHODS

A cross-sectional hospital-based study was conducted at the Hind Institute of Medical Sciences' Eye Outpatient Department in

Safedabad, Barabanki, Uttar Pradesh, India from September 2023 to December 2023. This study has been approved by the Institutional Human Ethics Committee (UID#HIMS/IHEC/2023-24/Faculty).

**Inclusion criteria:** All patients between 18-70 years of age, who had glaucomatous disc cupping, visual field defects, and had given informed consent to participate in the study, were included in the study.

**Exclusion criteria:** Participants who had not given informed consent, had secondary glaucoma, had optic nerve disease, cases with a present and past history of psychiatric illness, had a family history of psychiatric illness, and had a history of surgery within the last three months were excluded from the study.

**Sample size calculation:** The adequate sample size was calculated using the Cochran formula:

$$N = Z^2 \alpha * p(1-p) / E^2$$

The prevalence of glaucoma in India ranges from 2-13% [1]. For this study,  $p=7.5\%$  (average proportion of prevalence) and  $E=5\%$  (0.05 absolute margin of error).  $Z=1.96$  (critical value of standard normal variate at  $\alpha$  level of significance). The calculation was  $N=(1.96)^2 * 0.075 * (1-0.075) / (0.05)^2 = 106.6$  ( $N=110$ ).

## Study Procedure

Participants were explained the procedure, and consent was obtained. They were asked about socio-demographic details, medical history, and ophthalmic history through individual interviews. Ophthalmic examinations were performed on all patients, which included best-corrected visual acuity by Snellen charts, slit lamp examination, IOP measurement by Applanation tonometer, gonioscopy by a three-mirror gonioscope, optic disc evaluation by a +90 D lens, and visual field examination using Humphrey Field Analyser (HFA) (30-2).

The severity of glaucoma is graded according to the mean deviation value of the visual field. MD < -6 D is graded as mild, MD -6 to -12 D as moderate, and MD > -12 D as severe, as defined by Hodapp-Parrish-Anderson's criteria [28].

The HAM-A, HAM-D, and Glaucoma QoL Questionnaire (GQL-15) were used to evaluate anxiety, depression, and their impact on QoL, respectively. The HAM-A scale consists of 14 items, with each item scored from 0 (not present) to 4 (severe), resulting in a total score range of 0-56. Scores below 17 indicate mild severity, 18-24 indicate mild to moderate, and 25-30 indicate moderate to severe levels of anxiety [29]. The HAM-D Rating scale consists of 17 items, with each item scored from 0 to 4. When detailed information cannot be obtained, scores of 0 to 2 are used. Levels of depression are categorised as mild (8-16), moderate (17-23), and severe ( $\geq 24$ ) [30]. The GQL-15 questionnaire comprises 15 items and four domains addressing factors of visual disability: central and near vision, peripheral vision, dark adaptation and glare, and outdoor mobility. Each factor is coded from 0 to 5, where '0' indicates abstaining from activities due to non visual reasons, '1' means no difficulty, and '5' represents severe difficulty [31]. A higher score indicates a poorer QoL.

## STATISTICAL ANALYSIS

Statistical software (SPSS version 27.0) was used for data analysis. The ANOVA test was performed to determine the association between the various variables, while the Chi-square and Fisher's exact test were used to find differences in proportions. A significance level of  $p$ -value < 0.05 was considered significant.

## RESULTS

A total of 110 individuals were enrolled. The mean age of the studied patients was  $52.6 \pm 12.2$  years. In this study, male patients outnumbered females ( $n=63$ , 57.3% compared to  $n=47$ , 42.7%), with most patients being new cases 74 (67.3%) [Table/Fig-1].

Parameters		n (%)
Age (years)	Mean $\pm$ SD	52.6 $\pm$ 12.2
Age group	<30	6 (5.5)
	30-50	41 (37.3)
	51-70	61 (55.5)
	>70	2 (1.8)
Gender	Female	47 (42.7)
	Male	63 (57.3)
Marital status	Married	108 (98.2)
	Unmarried	2 (1.8)
Socio-economic status	Upper class	0
	Upper middle class	2 (1.8)
	Middle class	46 (41.8)
	Lower middle class	52 (47.3)
	Lower class	10 (9.1)
Number of drugs	One drug	19 (17.3)
	Two drugs	10 (9.1)
	Three drugs	4 (3.6)
	Four drugs	6 (5.5)
	Five drugs	0
	Six drugs	2 (1.8)
	No drug	65 (59.1)
	Surgery	4 (3.6)
Duration of illness	New cases	74 (67.3)
	On treatment	36 (32.7)

[Table/Fig-1]: Socio-demographic characteristics of study participants (n=110).

Regarding the severity of glaucoma, 31 (28.2%) study participants had a mild condition, 30 (27.3%) had a moderate condition, and 49 (44.5%) had a severe condition. Concerning anxiety levels, 27 (24.5%) participants experienced mild anxiety, 56 (50.9%) had moderate anxiety, and 27 (24.5%) reported severe anxiety. In terms of depression levels, 8 (7.3%) had mild depression, 59 (53.6%) had moderate depression, and 27 (39.1%) had severe depression levels [Table/Fig-2].

Clinical characteristics		n (%)
Severity of glaucoma	Mild	31 (28.2)
	Moderate	30 (27.3)
	Severe	49 (44.5)
Anxiety level	Mild	27 (24.5)
	Moderate	56 (50.9)
	Severe	27 (24.5)
Depression level	Mild	8 (7.3)
	Moderate	59 (53.6)
	Severe	43 (39.1)

[Table/Fig-2]: Distribution of clinical characteristics among participants (n=110).

For anxiety levels, there was a statistically significant association with the severity of glaucoma ( $\chi^2=18.509$ ,  $p$ -value=0.0018). Similarly, concerning depression levels, there was a significant association with the severity of glaucoma ( $\chi^2=19.439$ ,  $p$ -value=0.001). Specifically, individuals with severe glaucoma were more likely to experience moderate anxiety (57.1%) and moderate depression (51.0%), while those with mild glaucoma were observed to have lower anxiety levels (41.9%) and lower depression levels (16.1%) [Table/Fig-3].

Significant variations were noted between the QoL categories and glaucoma severity levels when considering QoL components ( $p$ -value < 0.001). This suggests that the severity of glaucoma impacts various aspects of QoL, with more severe cases associated with lower reported QoL [Table/Fig-4].

		Severity of glaucoma			Chi-square	p-value
		Mild (n=31)	Moderate (n=30)	Severe (n=49)		
		n (%)	n (%)	n (%)		
Anxiety level	Mild (n=27)	13 (41.9)	11 (36.7)	3 (6.1)	18.509	0.0018*
	Moderate (n=56)	14 (45.2)	14 (46.7)	28 (57.1)		
	Severe (n=56)	4 (12.9)	5 (16.7)	18 (36.7)		
Depression level	Mild (n=8)	5 (16.1)	3 (10)	0	19.439	0.001†
	Moderate (n=59)	22 (71)	12 (40)	25 (51.0)		
	Severe (n=43)	4 (12.9)	15 (50)	24 (48.9)		

**[Table/Fig-3]:** Association of anxiety level and depression with severity of glaucoma. \*Chi-square test; †Fisher-exact test; ( )=column %

Quality of life	Severity of glaucoma			F-value	p-value‡
	Mild	Moderate	Severe		
	Mean±SD	Mean±SD	Mean±SD		
Peripheral vision	4.9±6.4	10.4±6.7	19.4±5.9	54.06	<0.001
Dark adaptation and glare	6.8±8.0	14.9±8.3	23.8±6.0	53.24	<0.001
Central and near vision	0.6±1.5	2.0±2.2	5.1±2.4	47.30	<0.001
Outdoor mobility	0.1±0.2	0.2±0.4	1.1±1.1	23.62	<0.001

**[Table/Fig-4]:** Comparison of Quality-of-Life (QoL) factors between severity of glaucoma.

‡One-way analysis of variance (ANOVA)

The association of the severity of glaucoma, anxiety levels, and depression levels was assessed with QoL (measured by the GQL-15 Questionnaire). As the severity of glaucoma increased, there was a corresponding decrease in QoL, which was statistically significant (p-value <0.001). Similarly, for anxiety levels, participants with higher levels of anxiety were associated with lower QoL scores (p-value <0.001). Individuals with more severe depression were observed to have lower QoL compared to those with milder levels of depression (p-value <0.001) [Table/Fig-5].

		GQL-15 (Quality of life)		F-value	p-value*
		Mean±SD			
Severity of glaucoma	Mild	13.5±16.5		59.122	<0.001
	Moderate	27.5±16.9			
	Severe	50.4±13.3			
Anxiety level	Mild	20.4±19.7		10.239	<0.001
	Moderate	34.7±19.5			
	Severe	45.1±22.2			
Depression level	Mild	22.5±17.7		4.869	0.009
	Moderate	29.8±21.7			
	Severe	41.3±20.9			

**[Table/Fig-5]:** Comparison of severity of glaucoma, anxiety level, and depression level with Quality of Life (QoL).

\*One-way analysis of variance (ANOVA)

## DISCUSSION

Glaucoma is a chronic disease that can lead to blindness if not diagnosed early. Therefore, not only the diagnosis itself but also lifelong treatment, long-term follow-up, treatment costs, fear of losing eyesight, fear of losing a job, inability to earn, and dependence on others due to the loss of visual function impact individuals' mental status in the form of anxiety and depression, ultimately decreasing their QoL [1].

The participants in this study had a mean age of 52.6±12.2 years. In terms of age distribution, 55.5% of participants were in the

51-70 age group, which was comparable to the findings of the Dawodu O et al., [32]. Regarding gender, there was a slightly higher representation of males (57.3%) compared to females (42.7%) in the present study.

In this study, glaucoma severity was noted as follows: 28.2% of participants had a mild condition, 27.3% had a moderate condition, and 44.5% had a severe condition. Regarding anxiety levels, 24.5% of participants experienced mild anxiety, 50.9% had moderate anxiety, and 24.5% reported severe anxiety. In terms of depression levels, 7.3% showed mild depression, 53.6% had moderate depression, 21.8% had severe depression, and 17.3% had a very severe level of depression. Similar to a study by Dawodu O et al., where the prevalence of anxiety and depression was 10% and 6%, respectively, this study demonstrated that anxiety was more common than depression in individuals with POAG [32].

Ubochi CC et al., found that most glaucoma patients had a moderate form of the disease before developing a severe type. Compared to controls, glaucoma patients (p-value <0.001) had worse mental health, with 32.8% reporting anxiety and 21.7% reporting depression [33]. In contrast to patients in China, the occurrence of anxiety and depression among those with glaucoma was 12.11% and 25.78%, respectively [34]. A different research study carried out in Greece revealed that individuals with POAG experienced much greater levels of anxiety and depression compared to those without the condition, who were considered healthy [35].

Cumurcu T et al., found that there was no notable variance in anxiety levels between patients with POAG and the control group; however, anxiety was more common among those with POAG. A research study in Korea further showed that glaucoma patients experienced significantly more anxiety and depression compared to controls [36]. In the study by Mabuchi F et al., compared to that of reference subjects, the prevalence of anxiety (13%, p-value <0.03) and depression (10.9%, p-value <0.026) was significantly higher in POAG patients [37].

There was a statistically significant association between anxiety levels and the severity of glaucoma ( $\chi^2=18.509$ , p-value=0.001). Specifically, individuals with severe glaucoma were more likely to experience moderate anxiety levels (57.1%), while those with mild glaucoma tend to have lower anxiety levels (41.9%). These findings were consistent with studies by Dawodu O et al., Fasih U et al., and Demailly P et al., [32,38,39]. Similarly, concerning depression levels, there was a significant association with the severity of glaucoma ( $\chi^2=19.439$ , p-value=0.001). Notably, participants with severe glaucoma exhibited higher levels of moderate depression (51.0%), while those with mild glaucoma tend to have lower depression levels (16.1%), as seen in studies by Dawodu O et al., and Mabuchi F et al., [32,37].

According to Demailly P et al., patients with severe POAG were more likely to exhibit anxious personality traits and anxiety disorders [39]. The association of psychiatric co-morbidity with the severity of glaucoma cases was examined. It was found that both anxiety and depression increased with the severity of glaucoma. This was in contrast to the study by Ha MS et al., which found that depression was not associated with glaucoma severity, but anxiety was [40].

Psychological self-training in daily life, in addition to medical and surgical treatment, can help reduce anxiety and depression. The QoL factors examined include peripheral vision, dark adaptation and glare, central and near vision, and outdoor mobility. Statistically significant differences were observed across all factors of QoL with different severity levels of glaucoma (p-value <0.001). This suggests that the severity of glaucoma impacts various aspects of QoL, with more severe cases associated with lower reported QoL across these factors. These findings were consistent with outcomes from other recent studies [41-44]. Dark adaptation and glare were the most commonly and early affected factors, similar to findings in other studies [41].

Author's name	Publication year	Place of study	Number of subjects	Objective parameters assessed	Conclusion
Tastan S et al., [46]	2010	Turkey	121	The goal was to look into how glaucoma patients' QoL and anxiety and depression related to each other	As QoL scores decreased, the prevalence of anxiety and depression rose.
Naveen B et al., [45]	2014	Bangalore	60	The glaucoma QoL-15 GQL-15 questionnaire was used to evaluate the QoL in glaucoma patients with Indian eyes	Individuals with mild glaucoma also had lower G-QoL. People with severe visual field loss due to glaucoma find it extremely difficult to perform daily tasks.
Midha N et al., [43]	2019	India	100	Evaluation of vision-related QoL using the GQL-15 questionnaire	Glaucoma patients had reduced vision-related QoL so efforts are made to preserve function in these patients.
Ayele FA et al., [42]	2017	Ethiopia	307	Assessing glaucoma QoL by using the GQoL-15 questionnaire	The main goal of glaucoma is not only to preserve vision but should include enhancement of QoL.
Ubochi CC, et al., [33]	2020	Southeast Nigeria	180	To assess how glaucoma affects POAG patients' mental health by administering the Hospital Anxiety and Depression Scale (HADS)	Patients' mental health is impacted by primary open angle glaucoma, and the disease's severity exacerbates it.
Wu N et al., [34]	2022	Shanghai, China	446	Using the National eye institute visual function Questionnaire-25 questionnaire and the Hospital Anxiety and Depression Scale (HADS), this study aimed to examine anxiety and depression in glaucoma patients and its relationship to vision-related QoL	Chinese glaucoma patients frequently experience anxiety and depression, so self-reported vision related-QoL was helpful in determining psychological status.
Aboulnasr TT et al., [41]	2021	Egypt	175	To evaluate and compare the GQL-15 questionnaire-based functional disability in POAG patients	Patients with glaucoma face difficulties carrying out various tasks and numerous functional impairments.
Ajith B et al., [49]	2022	Kerala	148	Assess the strength and direction of the relationship between a glaucoma patient's QoL and anxiety and depression	The lack of ophthalmological risk factors highlights how crucial psychological testing and coordinated treatment with a psychiatrist are to the management of glaucoma.
Sen S et al., [48]	2024	Eastern India	199	This study aims to assess the QoL in glaucoma patients and find out socio-demographic factors predicting QoL	Glaucoma affects vision, QoL of the patient and affects psychological aspects of the patient's life as well.
Present study	2024	Barabanki, Uttar Pradesh	110	To find an association between glaucoma and mental disorders like anxiety and depression and QoL	Glaucoma significantly affects the mental health status of patients in the form of depression and anxiety and it significantly reduces QoL.

**[Table/Fig-6]:** Comparative analysis of similar studies from the literature [33,34,41-43,45,46,48,49].

There were significant differences observed among the severity groups ( $F=59.122$ ,  $p$ -value  $<0.001$ ), indicating that as the severity of glaucoma increases, there is a corresponding decrease in QoL, as concluded in the study by Naveen B et al., [45]. Similarly, for anxiety levels, participants with different levels of anxiety (mild, moderate, severe) show significant differences in their QoL scores ( $F=10.239$ ,  $p$ -value  $<0.001$ ). Higher levels of anxiety are associated with higher QoL scores, which means poor QoL, as shown in the study by Tastan S et al., [46]. As QoL scores increased, so did the incidence of anxiety and depression. Regarding depression levels, there was also a significant difference in QoL scores among participants with different levels of depression ( $F=4.869$   $p$ -value  $0.009$ ). Specifically, individuals with more severe depression tend to have a lower QoL compared to those with milder levels of depression, as shown in a study by Skalicky S and Goldberg I, where there was a rising prevalence and severity of depression [47]. As glaucoma severity increased, GQL-15 scores also increased, thus indicating a decline in QoL, as demonstrated in various comparative studies [Table/Fig-6] [33,34,41-43,45,46,48,49].

Changes in IOP had an impact on the psychological domain of QoL. However, disease severity and QoL did not show a significant correlation. As noted by Sen S et al., their study revealed compromised GQL-15 scores in glaucoma patients according to severity, reflecting the influence of the disturbed mental status of patients [48]. This emphasises the importance of assessing G-QoL at baseline and during every follow-up. Evaluating QoL, anxiety, and depression in glaucoma patients is crucial for providing early healthcare services and preventive psychological treatment. The current work sets the stage for future investigations into therapies aimed at improving QoL and reducing the physiological and psychological strain caused by this persistent illness that poses a threat to vision.

### Limitation(s)

A limitation noted during the interpretation of results was the lack of patient follow-up. Over the time, glaucoma patients may experience

changes in their mental state and overall QoL. Therefore, comparable research with extended follow-up is necessary.

### CONCLUSION(S)

It was found that glaucoma significantly affects the mental health status of patients in the form of depression and anxiety, and it significantly reduces QoL. Therefore, every possible effort must be made not only to preserve visual function but also to take care of their mental state and QoL. Physicians can better understand the effects of the disease from the perspective of their patients by evaluating these factors, which also helps them identify priority areas for their care.

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